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CLAIMS

(57) [Claim(s)]

[Claim 1] The guidance support chain characterized by providing or including the following. The link object with which the upper limb and lower edge of a side board of a right-and-left couple were constructed across horizontally. While the side boards of a ***** link object overlap crosswise, it is connected possible [rotation]. While forming the receipt space of a flexible body in the connected link inside of the body and forming the straight-line posture maintenance stopper which maintains the straight-line posture of link objects to the side board of one link object of a ***** link object The straight-line posture maintenance stopper side which contacts the aforementioned straight-line posture maintenance stopper is formed in the side board of the link object of another side of a ***** link object. While forming the crookedness posture limit stopper which restricts the crookedness posture of link objects to the side board of one link object of a ***** link object In the guidance support chain which formed in the side board of the link object of another side of a ***** link object the crookedness posture limit stopper side which contacts the aforementioned crookedness posture limit stopper The straight-line posture maintenance stopper of step [1st] ... the Nth step and a straight-line posture maintenance stopper side are formed one by one as the radius from the center of rotation of the side boards of a ***** link object becomes large. It is a crevice between the straight-line posture maintenance stopper of the n+1st aforementioned step, and the straight-line posture maintenance stopper side of the n+1st step at the time of contact of the straight-line posture maintenance stopper of the n-th step, and a straight-line posture maintenance stopper side.

[Claim 2] The guidance support chain characterized by providing or including the following. The link object with which the upper limb and margo inferior of a side board of a right-and-left couple were constructed across horizontally. While the side boards of a ***** link object overlap crosswise, it is connected possible [rotation]. While forming the receipt space of a flexible body in the connected link inside of the body and forming the straight-line posture maintenance stopper which maintains the straight-line posture of link objects to the side board of one link object of a ***** link object The straight-line posture maintenance stopper side which contacts the aforementioned straight-line posture maintenance stopper is formed in the side board of the link object of another side of a ***** link object. While forming the crookedness posture limit stopper which restricts the crookedness posture of link objects to the side board of one link object of a ***** link object In the guidance support chain which formed in the side board of the link object of another side of a ***** link object the crookedness posture limit stopper side which contacts the aforementioned crookedness posture limit stopper The crookedness posture limit stopper of step [1st] ... the Nth step and a crookedness posture limit stopper side are formed one by one as the radius from the center of rotation of the side boards of a ***** link object becomes large. It is a crevice between the crookedness posture limit stopper of the n+1st aforementioned step, and the crookedness posture limit stopper side of the n+1st step at the time of contact of the crookedness posture limit stopper of the n-th step, and a crookedness posture limit stopper side.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the chain for carrying out guidance support of the aforementioned flexible body safely and certainly during movement of a movable machine while containing flexible bodies which supply energy, such as power and the compressed air, to a movable machine, such as a cable and a hose.

[0002]

[Description of the Prior Art] The conventional guidance support chain forms the receipt space of a flexible body in the link inside of the body which was connected possible [rotation] while it has the link object with which the upper limb and margo inferior of a side board of a right-and-left couple were constructed across horizontally and the side boards of a ***** link object overlapped crosswise as indicated by JP,2-250621,A, and was connected. The link object of the end section of a guidance support chain is attached in a movable machine, and the link object of the other end of a guidance support chain is attached in the floor in which the movable machine was installed. And a guidance support chain forms in the side board of the link object of another side of a ***** link object the stopper side which contacts the aforementioned stopper while forming the stopper which restricts angle of rotation of link objects to the side board of one link object of a ***** link object. When a stopper side contacts a stopper mutually, as for link objects, an incurvation posture is maintained while a straight-line posture is restricted.

[0003]

[Problem(s) to be Solved by the Invention] With such a guidance support chain, in case a movable machine moves and link objects repeat a crookedness posture and a straight-line posture, a stopper and a stopper side collide and contact sound is generated. If the traverse speed of a movable machine becomes large, this contact sound will also become large. The collision speed " v " of contact sides is expressed with $v=r\text{-}\omega$ when angular velocity at the time of " r " and a collision is set to " ω " for the average radius from the center of rotation to a stopper and a stopper side. Since angular velocity is the function of the traverse speed of a movable machine, when it sets this constant, the parameter leading to the size of contact sound is an average radius from the center of rotation to a stopper and a stopper side. In addition, in this specification, an "average radius" shall mean the average of the minimum radius and maximum radius of a contact side in the state where the stopper side contacted the stopper.

[0004] With the conventional guidance support chain, it is not taken into consideration at all about making small the average radius from the center of rotation to a stopper and a stopper side, but the contact sound of a stopper and a stopper side cannot but become large. Therefore, in case a guidance support chain is used, generating a remarkable noise is expected. With the conventional guidance support chain, this noise will always occur and there were on stream [of a movable machine] and a problem of worsening a work environment.

[0005] On the other hand, the average radius from the center of rotation to a stopper and a stopper side influences greatly the rigidity in the case of bending from the rigidity in the case of crooking further from an incurvation posture, and a straight-line posture, after a stopper side contacts a stopper. The aforementioned noise will become small if the aforementioned average radius is made small. However, on the other hand, a rigid fall poses a serious problem. The permission moment M after the collision with a stopper and a stopper side is expressed with $M=F\text{-}r$ when the force of acting

between a stopper and a stopper side is set to "F." The permission moment M becomes small as the average radius r will become small, if the force F of acting is set constant. Therefore, by the small part, the elastic deformation of a stopper or a stopper side becomes [the average radius r] large, and the rigidity of a guidance support chain falls. And there is a problem which does an injury also to a peripheral device besides the problem which move tracing of a guidance support chain becomes easy to change, a guidance support chain contacts a peripheral device, and itself is damaged, and damages flexible bodies, such as a cable and a hose.

[0006] In the guidance support chain of a flexible body, the purpose of this invention is improving the rigidity in the case of bending from a straight-line posture while reducing the stopper which maintains a straight-line posture, and the noise generated from a stopper side. In the guidance support chain of a flexible body, other purposes of this invention are improving the rigidity in the case of carrying out which will be further crooked from a crookedness posture while reducing the stopper which restricts a crookedness posture, and the noise generated from a stopper side.

[0007]

[Means for Solving the Problem] Invention of a claim 1 has the link object with which the upper limb and lower edge of a side board of a right-and-left couple were constructed across horizontally. While the side boards of a ***** link object overlap crosswise, it is connected possible [rotation]. While forming the receipt space of a flexible body in the connected link inside of the body and forming the straight-line posture maintenance stopper which maintains the straight-line posture of link objects to the side board of one link object of a ***** link object The straight-line posture maintenance stopper side which contacts the aforementioned straight-line posture maintenance stopper is formed in the side board of the link object of another side of a ***** link object. While forming the crookedness posture limit stopper which restricts the crookedness posture of link objects to the side board of one link object of a ***** link object In the guidance support chain which formed in the side board of the link object of another side of a ***** link object the crookedness posture limit stopper side which contacts the aforementioned crookedness posture limit stopper The straight-line posture maintenance stopper of step [1st] ... the Nth step and a straight-line posture maintenance stopper side are formed one by one as the radius from the center of rotation of the side boards of a ***** link object becomes large. The aforementioned technical problem was solved with the guidance support chain which prepared the crevice between the straight-line posture maintenance stopper of the n+1st aforementioned step, and the straight-line posture maintenance stopper side of the n+1st step at the time of contact of the straight-line posture maintenance stopper of the n-th step, and a straight-line posture maintenance stopper side.

[0008] for example, with the guidance support chain formed only two steps, a straight-line posture maintenance stopper and a straight-line posture maintenance stopper side The straight-line posture maintenance stopper of the 1st step and the straight-line posture maintenance stopper side of the 1st step are formed in a position. the radius from the center of rotation of the side boards of a ***** link object -- smallness -- The straight-line posture maintenance stopper of the 2nd step and the straight-line posture maintenance stopper side of the 2nd step are formed in the position which consists of the center of rotation of the side boards of a ***** link object radius size. The guidance support chain which solves the aforementioned technical problem consists of preparing a crevice between the straight-line posture maintenance stopper of the 2nd aforementioned step, and the straight-line posture maintenance stopper side of the 2nd step at the time of contact of the straight-line posture maintenance stopper of the 1st aforementioned step, and the straight-line posture maintenance stopper side of the 1st step.

[0009] Invention of a claim 2 has the link object with which the upper limb and margo inferior of a side board of a right-and-left couple were constructed across horizontally. While the side boards of a ***** link object overlap crosswise, it is connected possible [rotation]. While forming the receipt space of a flexible body in the connected link inside of the body and forming the straight-line posture maintenance stopper which maintains the straight-line posture of link objects to the side board of one link object of a ***** link object The straight-line posture maintenance stopper side which contacts the aforementioned straight-line posture maintenance stopper is formed in the side board of the link object of another side of a ***** link object. While forming the incurvation posture limit stopper which restricts the incurvation posture of link objects to the side board of one link object of a ***** link object In the guidance support chain which formed in the side board of the link object

of another side of a ***** link object the incurvation posture limit stopper side which contacts the aforementioned incurvation posture limit stopper The incurvation posture limit stopper of step [1st] ... the Nth step and an incurvation posture limit stopper side are formed one by one as the radius from the center of rotation of the side boards of a ***** link object becomes large. The aforementioned technical problem was solved with the guidance support chain which prepared the crevice between the incurvation posture limit stopper of the n+1st aforementioned step, and the incurvation posture limit stopper side of the n+1st step at the time of contact of the incurvation posture limit stopper of the n-th step, and an incurvation posture limit stopper side.

[0010] for example, with the guidance support chain formed only two steps, a crookedness posture limit stopper and a crookedness posture limit stopper side The crookedness posture limit stopper of the 1st step and the crookedness posture limit stopper side of the 1st step are formed in a position. the radius from the center of rotation of the side boards of a ***** link object -- smallness -- The crookedness posture limit stopper of the 2nd step and the crookedness posture limit stopper side of the 2nd step are formed in the position which consists of the center of rotation of the side boards of a ***** link object radius size. The guidance support chain which solves the aforementioned technical problem consists of preparing a crevice between the crookedness posture limit stopper of the 2nd aforementioned step, and the crookedness posture limit stopper side of the 2nd step at the time of contact of the crookedness posture limit stopper of the 1st aforementioned step, and the crookedness posture limit stopper side of the 1st step.

[0011]

[Function] When a guidance support chain takes a straight-line posture among ***** link objects, the straight-line posture maintenance stopper of the 1st step (the n-th step) and the straight-line posture maintenance stopper side of the 1st step (the n-th step) contact first. In this state, the straight-line posture maintenance stopper of the 2nd step (the n+1st) and the straight-line posture maintenance stopper side of the 2nd step (the n+1st) had a fixed crevice, and have estranged. The average radius of the contact side of the straight-line posture maintenance stopper of the 1st step and the straight-line posture maintenance stopper side of the 1st step is smaller than the average radius of the contact side of the straight-line posture maintenance stopper of the 2nd step, and the straight-line posture maintenance stopper side of the 2nd step, and the collision speed at the time of contact of the straight-line posture maintenance stopper of the 1st step and the straight-line posture maintenance stopper side of the 1st step ($v=r-\omega$) becomes small in proportion to an average radius Therefore, the noise at the time of contact of the straight-line posture maintenance stopper of the 1st step and the straight-line posture maintenance stopper side of the 1st step is reduced.

[0012] The straight-line posture maintenance stopper of the 1st step and the straight-line posture maintenance stopper side of the 1st step start elastic deformation after contact. On the conditions that the force of acting on a contact side is large, the crevice between the straight-line posture maintenance stopper of the 2nd step and the straight-line posture maintenance stopper side of the 2nd step is lost by the elastic deformation produced in the aforementioned contact side. And the straight-line posture maintenance stopper side of the 2nd step contacts the straight-line posture maintenance stopper of the 2nd step. In this state, bending of ***** link objects is restricted, when the straight-line posture maintenance stopper of the 1st step, the straight-line posture maintenance stopper side of the 1st step, and the straight-line posture maintenance stopper of the 2nd step and the straight-line posture maintenance stopper side of the 2nd step contact.

[0013] The average radius of the contact side of the straight-line posture maintenance stopper of the 2nd step and the straight-line posture maintenance stopper side of the 2nd step is larger than the average radius of the contact side of the straight-line posture maintenance stopper of the 1st step, and the straight-line posture maintenance stopper side of the 1st step. Therefore, without being accompanied by this big elastic deformation in respect of contact, things can be carried out and the rigidity in the straight-line posture of a guidance support chain for which the big moment is permitted is raised.

[0014] In addition, the optimal value is determined by Young's modulus peculiar to the quality of the material of a side board, the average radius in the contact side of the straight-line posture maintenance stopper of the 1st step, and the straight-line posture maintenance stopper side of the 1st step, etc. about a setup of the crevice between the straight-line posture maintenance stopper of

the 2nd step, and the straight-line posture maintenance stopper side of the 2nd step. Moreover, it changes also with configurations of a contact side. But the rigidity of a guidance support chain can be raised at an early stage by making the contact to the straight-line posture maintenance stopper of the 2nd step, and the straight-line posture maintenance stopper side of the 2nd step start promptly. Therefore, as for the crevice between the straight-line posture maintenance stopper of the 2nd step, and the straight-line posture maintenance stopper side of the 2nd step, it is desirable to make it small. For example, a guidance support chain can maintain predetermined rigidity now from immediately after contact of the straight-line posture maintenance stopper of the 1st step, and the straight-line posture maintenance stopper side of the 1st step by setting the aforementioned crevice as the elastic deformation corresponding to the impulse force on which the 1st step, a straight-line posture maintenance stopper, and the straight-line posture maintenance stopper side of the 1st step act.

[0015] Although the above operation is explained about the guidance support chain which has the straight-line posture maintenance stopper of the 1st step and the 2nd step and the straight-line posture maintenance stopper side which were set to $N=2$, constitute [so that N may be made or more into three, the straight-line posture maintenance stopper in the side near the center of rotation and a straight-line posture maintenance stopper side may shift time gradually and it may contact one by one / a guidance support chain] is clear. Moreover, although the stopper and stopper side which maintain the straight-line posture of ***** link objects were explained, it is the same when ***** link objects restrict an incurvation posture.

[0016]

[Example] Hereafter, the example of this invention is explained with reference to a drawing. Drawing 1 shows the example of use of the guidance support chain of this invention. Two or more link objects 12 are connected possible [rotation], and the guidance support chain 10 is constituted. The end section of the guidance support chain 10 is attached in the processing equipment which needs power and the compressed air. This processing equipment is the movable machine M which moves along with a rail. Even if the movable machine M moves, it protects and shows the cable and hose which supply power and the compressed air to it to the guidance support chain 10, and it is carrying out continuation formation of the space which contains these flexible bodies inside. And the other end of the guidance support chain 10 is attached in the floor F in which the movable machine M was installed. If the movable machine M moves, the guidance support chain 10 will take a straight-line posture and a crookedness posture.

[0017] Drawing 2 shows the link object 12 which constitutes the guidance support chain 10. Each link object 12 has the side boards 14 and 14 of a right-and-left couple. As for the side boards 14 and 14, the upper limb and the lower edge are constructed across horizontally by the connecting plate 16. The side boards 14 and 14 and connecting plate 16 which constitute the link object 12 are a product made of a resin. The connecting plate (not shown) of a upper limb can be freely detached and attached to the side boards 14 and 14 of a right-and-left couple. The connecting plate 16 of a lower edge is formed in the side boards 14 and 14 of a right-and-left couple, and one. By removing the connecting plate of a upper limb, a flexible body is contained in a guidance support chain.

[0018] The straight-line posture maintenance stoppers 21a and 22a are formed in the inside side of the other end of the side boards 14 and 14 on either side. Each straight-line posture maintenance stopper 21a and 22a is projected from the inside side. Straight-line posture maintenance stopper 23a is further prepared also in the outside side of the end section of the side boards 14 and 14 on either side. Straight-line posture maintenance stopper 23a is projected from the outside side. The straight-line posture maintenance stopper sides 21b and 22b are established in the outside side of the end section of the side boards 14 and 14 on either side. Each straight-line posture maintenance stopper side 21b and 22b is dented from the outside side. Straight-line posture maintenance stopper side 23b is further prepared also in the inside side of the other end of the side boards 14 and 14 on either side. Straight-line posture maintenance stopper side 23b is dented from the inside side. When the ***** link objects 12 and 12 are connected, the straight-line posture maintenance stoppers 21a, 22a, and 23a and the straight-line posture maintenance stopper sides 21b, 22b, and 23b prevent that the ***** link objects 12 and 12 rotate beyond a straight-line posture by contacting mutually. A straight-line posture maintenance stopper consists of two straight-line posture maintenance stoppers 21a and 23a of the 1st step, and one straight-line posture maintenance stopper of 2nd step

22a. A straight-line posture maintenance stopper side consists of two straight-line posture maintenance stopper sides 21b and 23b of the 1st step, and one straight-line posture maintenance stopper side of 2nd step 22b. the straight-line posture maintenance stoppers 21a and 23a of the 1st step -- radial [from the center of rotation of the ***** link objects 12 and 12] -- smallness -- it prepares in a position -- having -- **** -- straight-line posture maintenance stopper of 2nd step 22a -- radial [from the aforementioned center of rotation] -- size -- it is prepared in the position moreover, the straight-line posture maintenance stopper sides 21b and 23b of the 1st step contact the straight-line posture maintenance stoppers 21a and 23a of the 1st step -- as -- radial [from the center of rotation of the ***** link objects 12 and 12] -- smallness -- it is prepared in the position and straight-line posture maintenance stopper side of 2nd step 22b contacts straight-line posture maintenance stopper of 2nd step 22a -- as -- radial [from the aforementioned center of rotation] -- size -- it is prepared in the position That is, if an average radius [in / the contact side of R1, R3, straight-line posture maintenance stopper of 2nd step 22a, and straight-line posture maintenance stopper side of 2nd step 22b / for the average radius of the contact side of the straight-line posture maintenance stoppers 21a and 23a of the 1st step and the straight-line posture maintenance stopper sides 21b and 23b of the 1st step] is set to R2, it is $R1 < R2$ and $R3 < R$ the case of this example -- R1 and R3 -- **** -- it is the same And as shown in drawing 3 , when the straight-line posture maintenance stoppers 21a and 23a of the 1st step and the straight-line posture maintenance stopper sides 21b and 23b of the 1st step start contact, straight-line posture maintenance stopper of 2nd step 22a and straight-line posture maintenance stopper side of 2nd step 22b are estranged in the predetermined crevice A. The size of Crevice A is smaller than the elastic deformation after the straight-line posture maintenance stoppers 21a and 23a of the 1st step, and the 1st-step contact of the straight-line posture maintenance stopper sides 21b and 23b.

[0019] Therefore, if the ***** link objects 12 and 12 rotate mutually and reach a straight-line posture, the straight-line posture maintenance stopper sides 21b and 23b of the 1st step will contact the straight-line posture maintenance stoppers 21a and 23a of the 1st step first. this time -- the straight-line posture maintenance stoppers 21a and 23a of the 1st step, and the straight-line posture maintenance stopper sides 21b and 23b of the 1st step -- an average radius -- smallness -- it collides comparatively slowly in a position the collision speed V -- $V=R1$ and ω , or $V=R3$ and ω -- becoming -- an average radius -- smallness -- the contact sound by collision in a position will become small Then, the straight-line posture maintenance stoppers 21a and 23a of the 1st step and the straight-line posture maintenance stopper sides 21b and 23b of the 1st step produce elastic deformation. The crevice between straight-line posture maintenance stopper of 2nd step 22a and straight-line posture maintenance stopper side of 2nd step 22b is lost, and, finally straight-line posture maintenance stopper of 2nd step 22a and straight-line posture maintenance stopper side of 2nd step 22b contact in the position which becomes average radius size. After straight-line posture maintenance stopper of 2nd step 22a and straight-line posture maintenance stopper side of 2nd step 22b contact, both the straight-line posture maintenance stoppers 21a and 23a of the 1st step, the straight-line posture maintenance stopper sides 21b and 23b of the 1st step, straight-line posture maintenance stopper of 2nd step 22a, and straight-line posture maintenance stopper side of 2nd step 22b resist crookedness of the ***** link objects 12 and 12. The moment M for restricting crookedness becomes $M=(F1, R1)+(F2, R2)+(F3, R3)$, and, thereby, the rigidity over the straight-line posture of the guidance support chain 10 is raised. in addition, the straight-line posture maintenance stoppers 21a and 23a of the 1st step and the straight-line posture maintenance stopper sides 21b and 23b of the 1st step -- an average radius -- smallness -- since it is prepared in the position, when the same moment acts, the force of acting on a contact side becomes large Therefore, it is easy to be able to expect so big elastic deformation and to manage the crevice between straight-line posture maintenance stopper of 2nd step 22a and straight-line posture maintenance stopper side of 2nd step 22b in the predetermined range.

[0020] In addition, after the straight-line posture maintenance stopper sides 21b and 23b of the 1st step contact the straight-line posture maintenance stoppers 21a and 23a of the 1st step and the contact sound by collision occurs, it is desirable for straight-line posture maintenance stopper of 2nd step 24a and straight-line posture maintenance stopper side of 2nd step 24b to contact promptly, and to raise the rigidity in a straight-line posture to the guidance support chain 10. Therefore, the aforementioned crevice has a small desirable thing.

[0021] The crookedness posture limit stoppers 24a and 25a are formed in the inside side of the other end of the side boards 14 and 14 on either side. Each crookedness posture limit stopper 24a and 25a is projected from the inside side. The crookedness posture limit stopper sides 24b and 25b are established in the outside side of the end section of the side boards 14 and 14 on either side. Each crookedness posture limit stopper side 24b and 25b is dented from the outside side. When the ***** link objects 12 and 12 are connected, the crookedness posture limit stoppers 24a and 25a and the crookedness posture limit stopper sides 24b and 25b prevent that the ***** link objects 12 and 12 rotate more than a fixed angle by contacting mutually. A crookedness posture limit stopper consists of 1st-step crookedness posture limit stopper 24a and crookedness posture limit stopper of 2nd step 25a. A crookedness posture limit stopper side consists of 1st-step crookedness posture limit stopper side 24b and crookedness posture limit stopper side of 2nd step 25b. 1st-step crookedness posture limit stopper 24a -- radial [from the center of rotation of the ***** link objects 12 and 12] -- smallness -- it prepares in a position -- having -- **** -- 2nd-step crookedness posture limit stopper 25a -- radial [from the aforementioned center of rotation] -- size -- it is prepared in the position moreover, 1st-step crookedness posture limit stopper side 24b contacts 1st-step crookedness posture limit stopper 24a -- as -- radial [from the center of rotation of the ***** link objects 12 and 12] -- smallness -- it is prepared in the position and 2nd-step crookedness posture limit stopper side 25b contacts 2nd-step crookedness posture limit stopper 25a -- as -- radial [from the aforementioned center of rotation] -- size -- it is prepared in the position That is, it is $R4 < R5$ if an average radius [in / the contact side of R4, 2nd-step crookedness posture limit stopper 25a, and 2nd-step crookedness posture limit stopper side 25b / for the average radius of the contact side of 1st-step crookedness posture limit stopper 24a and 1st-step crookedness posture limit stopper side 24b] is set to R5. And as shown in drawing 4, when 1st-step crookedness posture limit stopper 24a and 1st-step crookedness posture limit stopper side 24b start contact, 2nd-step crookedness posture limit stopper 25a and 2nd-step crookedness posture limit stopper side 25b are estranged in the predetermined crevice B. The size of this crevice B is smaller than the elastic deformation after 1st-step crookedness posture limit stopper 24a and the 1st-step contact of crookedness posture limit stopper side 24b.

[0022] Therefore, if the ***** link objects 12 and 12 rotate mutually and reach the predetermined degree of tilt angle, 1st-step crookedness posture limit stopper 24a and 1st-step crookedness posture limit stopper side 24b will contact first. this time -- 1st-step crookedness posture limit stopper 24a and 1st-step crookedness posture limit stopper side 24b -- an average radius -- smallness -- it collides comparatively slowly in a position the collision speed V -- $V=R4$ and ω -- becoming -- an average radius -- smallness -- the contact sound by collision in a position will become small Then, 1st-step crookedness posture limit stopper 24a and 1st-step crookedness posture limit stopper side 24b produce elastic deformation, the crevice between 2nd-step crookedness posture limit stopper 25a and 2nd-step crookedness posture limit stopper side 25b of them is lost, and, finally 2nd-step crookedness posture limit stopper 25a and 2nd-step crookedness posture limit stopper side 25b contact in the position which becomes average radius size. After 2nd-step crookedness posture limit stopper 25a and 2nd-step crookedness posture limit stopper side 25b contact, both 1st-step crookedness posture limit stopper 24a, crookedness posture limit stopper side of 1st step 24b, crookedness posture limit stopper of 2nd step 25a, and 2nd-step crookedness posture limit stopper side 25b resist crookedness of the ***** link objects 12 and 12. The moment M for restricting crookedness becomes $M=(F4, R4)+ (F5, R5)$, thereby, the rigidity over crookedness of the guidance support chain 10 is raised, and a guidance support chain is protected from decomposition or breakage. in addition, 1st-step crookedness posture limit stopper 24a and 1st-step crookedness posture limit stopper side 24b -- an average radius -- smallness -- since it is prepared in the position, when the same moment acts, the force of acting on a contact side becomes large Therefore, it is easy to be able to expect so big elastic deformation and to manage the crevice between straight-line posture maintenance stopper of 2nd step 25a and straight-line posture maintenance stopper side of 2nd step 25b in the predetermined range.

[0023] In addition, after 1st-step crookedness posture limit stopper 24a and 1st-step crookedness posture limit stopper side 24b contact and the contact sound by collision occurs, it is desirable in 2nd-step crookedness posture limit stopper 25a and 2nd-step crookedness posture limit stopper side 25b contacting promptly, raising the rigidity which resists the guidance support chain 10 at

crookedness, and protecting a guidance support chain from decomposition or breakage. Therefore, the aforementioned crevice has a small desirable thing.

[0024] Drawing 5 or drawing 7 shows the 2nd example of the guidance support chain by this invention. this example shows the guidance support chain which added the alteration to the straight-line posture maintenance stopper side established in the inside side of a straight-line posture maintenance stopper and a side board established in the outside side of the side boards 15 and 15. In this example, although the crookedness posture limit stoppers 24a and 25a and the crookedness posture limit stopper sides 24b and 25b are the same as the 1st example The straight-line posture maintenance stopper of an outside side One straight-line posture maintenance stopper of 1st step 26a, It consists of two straight-line posture maintenance stoppers 27a and 28a of the 2nd step, and the straight-line posture maintenance stopper side of an inside side is set to one straight-line posture maintenance stopper side of 1st step 26b from two straight-line posture maintenance stopper sides 27b and 28b of the 2nd step. Other signs show the same member as the 1st example. straight-line posture maintenance stopper of 1st step 26a, and straight-line posture maintenance stopper side of 1st step 26b -- an average radius -- smallness -- a position -- mutual -- contacting -- the straight-line posture maintenance stoppers 27a and 28a of the 2nd step, and the straight-line posture maintenance stopper sides 27b and 28b of the 2nd step -- an average radius -- size -- it contacts mutually in a position That is, if an average radius [in / the contact side of R6, the straight-line posture maintenance stoppers 27a and 28a of the 2nd step, and the straight-line posture maintenance stopper sides 27b and 28b of the 2nd step / for the average radius of the contact side of straight-line posture maintenance stopper of 1st step 26a and straight-line posture maintenance stopper side of 1st step 26b] is set to R7 and R8, it is $R6 < R7$ and $R6 < R8$ Other composition is the same as the 1st example.

[0025] In this example, since the straight-line posture maintenance stopper of the 1st step in the straight-line posture maintenance stopper of an outside side was brought close to the center of rotation and the average radius was made very small as compared with the 1st example, the contact sound by the collision of the straight-line posture maintenance stopper of the 1st step and the straight-line posture maintenance stopper side of the 1st step is reduced.

[0026] Although the above example explained the guidance support chain which consists of a stopper of the 1st step and the 2nd step, and a stopper side as $N = 2$, N may be made or more into three, time may be shifted from the side near the center of rotation, and a stopper and a stopper side may be made to contact gradually one by one.

[0027]

[Effect of the Invention] In invention of a claim 1, the straight-line posture maintenance stopper of step [1st] ... the Nth step and a straight-line posture maintenance stopper side are formed one by one as the radius from the center of rotation of the side boards of a ***** link object becomes large. By having prepared the crevice between the straight-line posture maintenance stopper of the n+1st aforementioned step, and the 2nd straight-line posture maintenance stopper side at the time of contact of the straight-line posture maintenance stopper of the n-th step, and a straight-line posture maintenance stopper side The straight-line posture maintenance stopper side of the 1st step is made to contact the straight-line posture maintenance stopper of the 1st step formed in the position. the time of a guidance support chain taking a straight-line posture -- a radius -- smallness -- Time difference is attached and the straight-line posture maintenance stopper of step [2nd] ... the Nth step and the straight-line posture maintenance stopper side of step [2nd] ... the Nth step which were formed in the position which becomes radius size after that are made to contact gradually one by one. Therefore, collision speed of the straight-line posture maintenance stopper of the 1st step and the straight-line posture maintenance stopper side of the 1st step can be made late, and the noise made in respect of contact is reduced. moreover -- a radius -- size -- the straight-line posture maintenance stopper of step [2nd] ... the Nth step is contacted in the straight-line posture maintenance stopper side of step [2nd] ... the Nth step, so that it becomes a position -- making -- a radius -- smallness -- the fault at the time of making it contact in a position can be compensated, the rigidity of a guidance support chain can be raised, and a predetermined straight-line posture can be maintained now namely, the stopper and the stopper side which establishes separately the stopper and the stopper side which participates in a collision, and the stopper and the stopper side which participates in rigidity, and participates in a collision -- a radius -- smallness -- it

prepares in a position, and after suppressing noise, the rigidity at the time of a straight-line posture can improve, and the move locus of a guidance support chain can maintain by it being delayed one by one and making the stopper and the stopper side which participates in rigidity contact further

[0028] ***** invention of a claim 2 to become large **, [the radius from the center of rotation of the side boards of a ***** link object] The crookedness posture limit stopper of step [1st] ... the Nth step and a crookedness posture limit stopper side are formed one by one. By having prepared the crevice between the crookedness posture limit stopper of the n+1st aforementioned step, and the 2nd crookedness posture limit stopper side at the time of contact of the crookedness posture limit stopper of the n-th step, and a crookedness posture limit stopper side The crookedness posture limit stopper side of the 1st step is made to contact the crookedness posture limit stopper of the 1st step formed in the position. the time of a guidance support chain taking a crookedness posture -- a radius -- smallness -- Time difference is attached and the crookedness posture limit stopper of step [2nd] ... the Nth step and the crookedness posture limit stopper side of step [2nd] ... the Nth step which were formed in the position which becomes radius size after that are made to contact gradually one by one. Therefore, collision speed of the crookedness posture limit stopper of the 1st step and the crookedness posture limit stopper side of the 1st step can be made late, and the noise made in respect of contact is reduced. moreover -- a radius -- size -- the crookedness posture limit stopper of step [2nd] ... the Nth step is contacted in the crookedness posture limit stopper side of step [2nd] ... the Nth step, so that it becomes a position -- making -- a radius -- smallness -- the fault at the time of making it contact in a position is compensated, while raising the rigidity of a guidance support chain, a guidance support chain can be protected from decomposition or breakage, and a predetermined crookedness posture can be maintained now Namely, the stopper and stopper side which participate in a collision, and the stopper and stopper side which participate in rigidity and decomposition / breakage protection are established separately. the stopper and stopper side which participate in a collision -- a radius -- smallness -- it prepares in a position, and by it being delayed one by one and making the stopper and stopper side which participate in rigidity contact further, after suppressing noise, the rigidity at the time of a crookedness posture can be improved, and the move locus of a guidance support chain can be maintained

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the side elevation showing the example which installed the guidance support chain.

[Drawing 2] It is the perspective diagram of the link object of the 1st example of a guidance support chain.

[Drawing 3] It is a side elevation in case the link object of a ***** couple is in a straight-line posture.

[Drawing 4] It is a side elevation in case the link object of a ***** couple is in a crookedness posture.

[Drawing 5] It is the perspective diagram of the link object of the 2nd example of a guidance support chain.

[Drawing 6] It is a side elevation in case the link object of a ***** couple is in a straight-line posture.

[Drawing 7] It is a side elevation in case the link object of a ***** couple is in a crookedness posture.

[Description of Notations]

F Floor M Movable machine

10 Guidance Support Chain 12 Link Object

14 15 Side board 16 Connecting plate

21a, 22a, 23a, 26a, 27a, 28a Straight-line posture maintenance stopper

21b, 22b, 23b, 26b, 27b, 28b Straight-line posture maintenance stopper side

24a, 25a Incurvation posture limit stopper

24b, 25b Crookedness posture limit stopper side

[Translation done.]